Fig 1

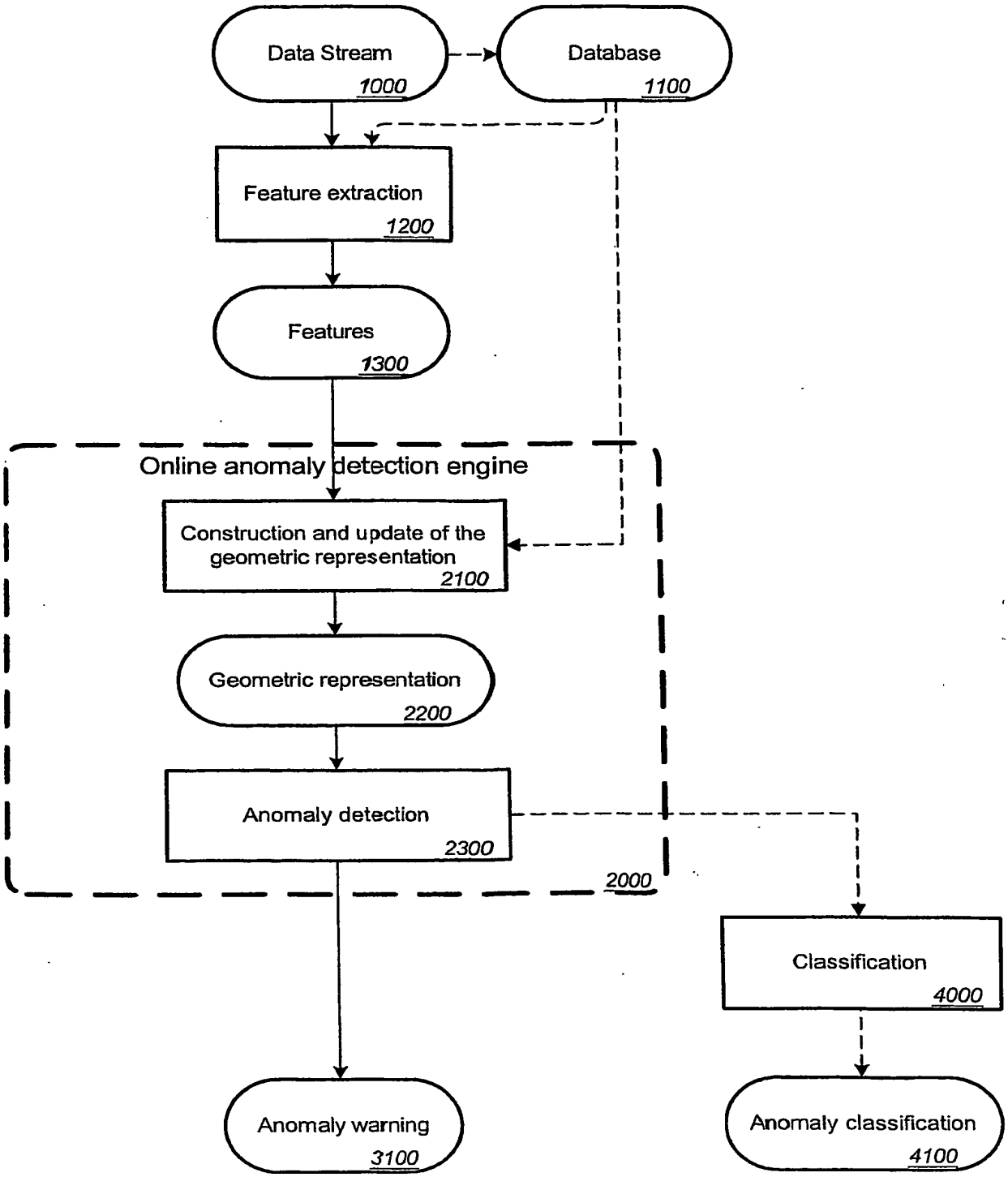
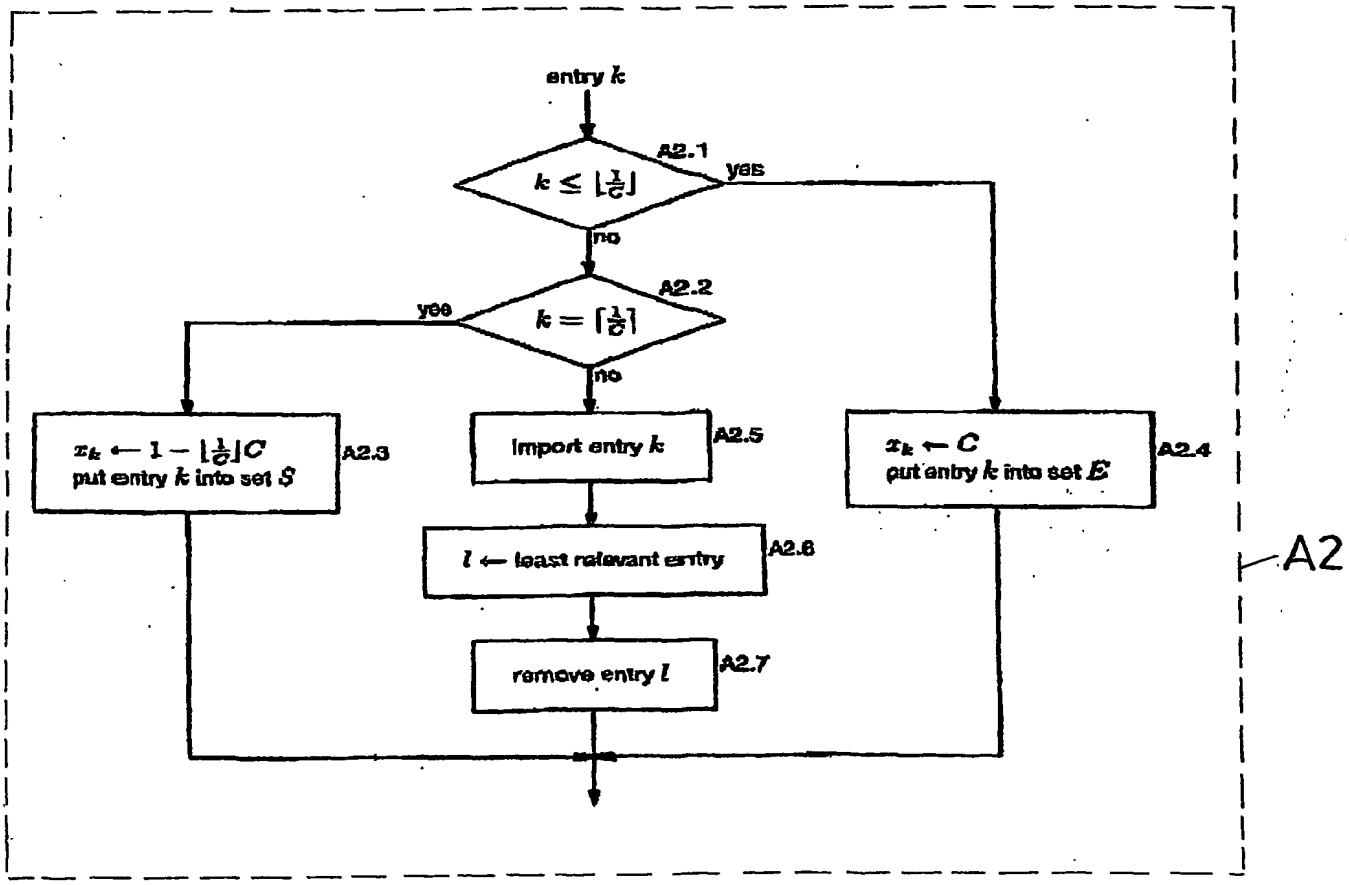

Data Stream
1000
Database
1100
Feature extraction
1200
Features
1300
Online anomaly detection engine
Construction and update of the geometric representation
2100
Geometric representation
2200
Anomaly detection
2300
2000
Classification
4000
Anomaly warning
3100
Anomaly classification
4100

FIG 2


entry k
A2.1
$k \leq \lfloor \frac{1}{C} \rfloor$
yes
no
A2.2
$k = \lceil \frac{1}{C} \rceil$
yes
no
$x_k \leftarrow 1 - \lfloor \frac{1}{C} \rfloor C$
put entry k into set S
A2.3
Import entry k
A2.5
$x_k \leftarrow C$
put entry k into set E
A2.4
$l \leftarrow$ least relevant entry
A2.6
remove entry l
A2.7
A2

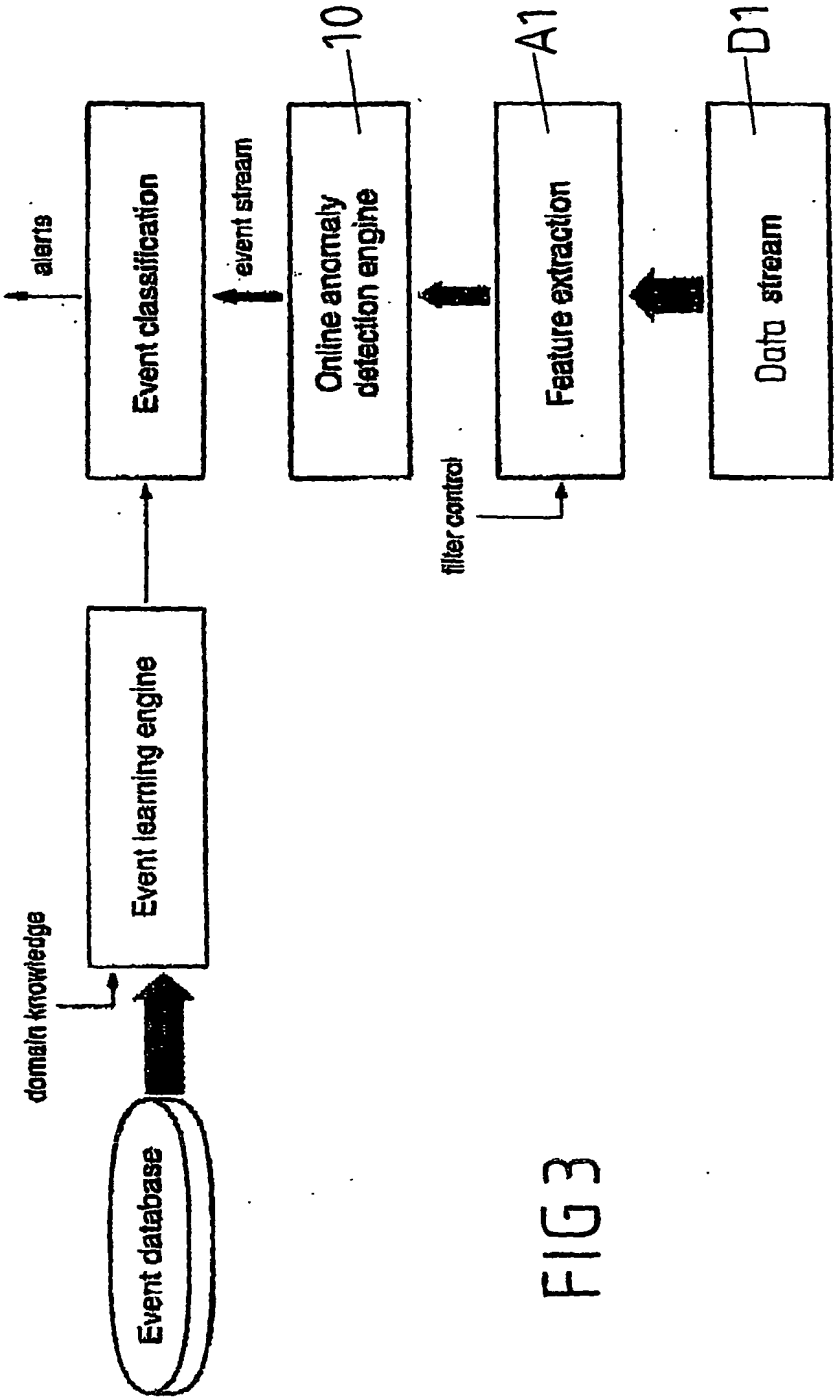

Event database
domain knowledge
Event learning engine
Event classification
alerts
event stream
Online anomaly detection engine
10
Feature extraction
A1
filter control
Data stream
D1

FIG 3

FIG 4A

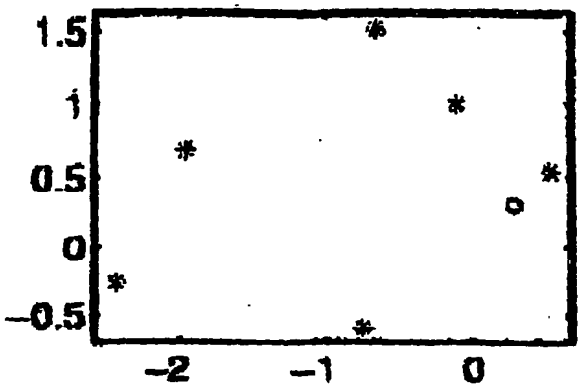


FIG 4B

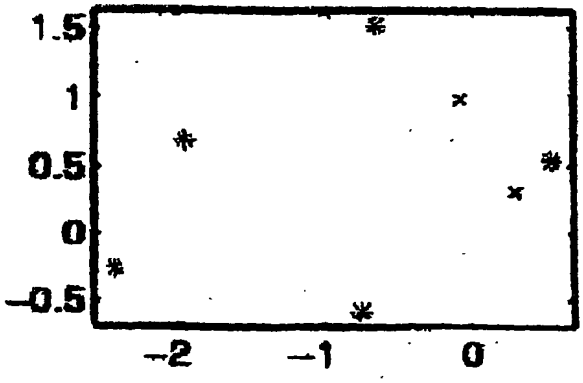


FIG 4C

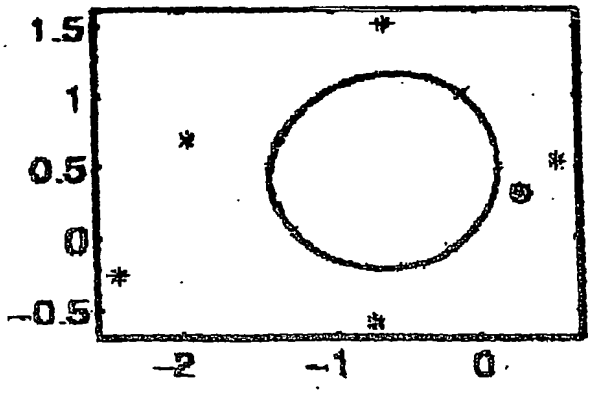


FIG 5A

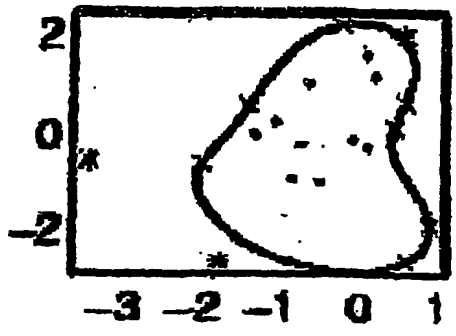


FIG 5B

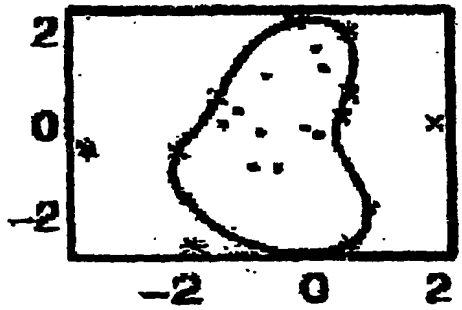


FIG 5C

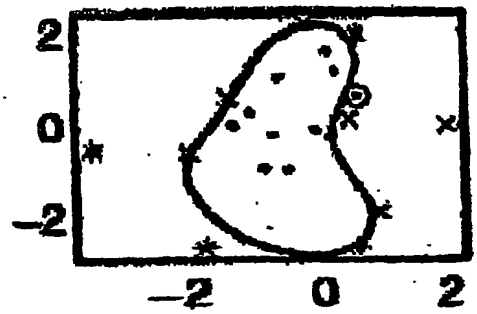


FIG 5D

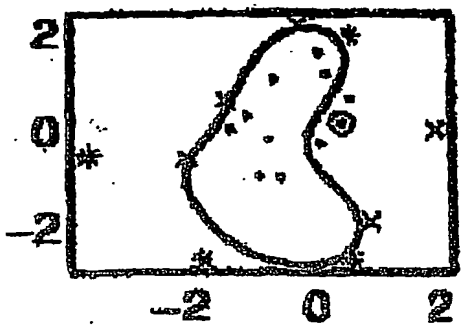


FIG 5E

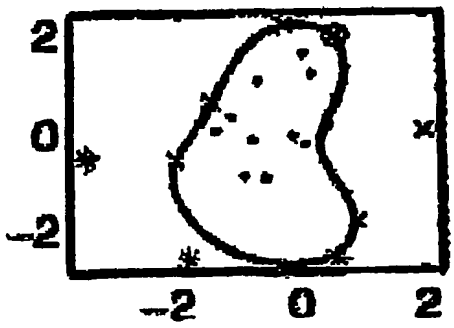


FIG 5F

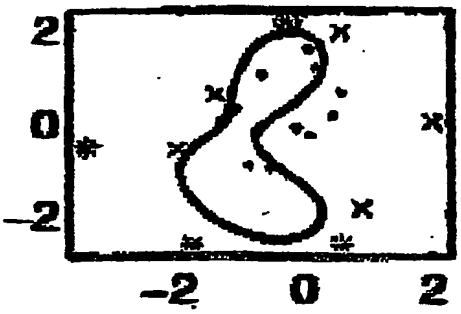


FIG 5G

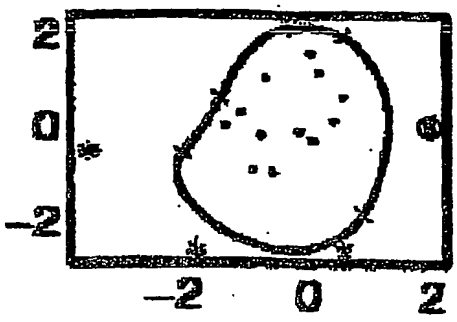


FIG 6A

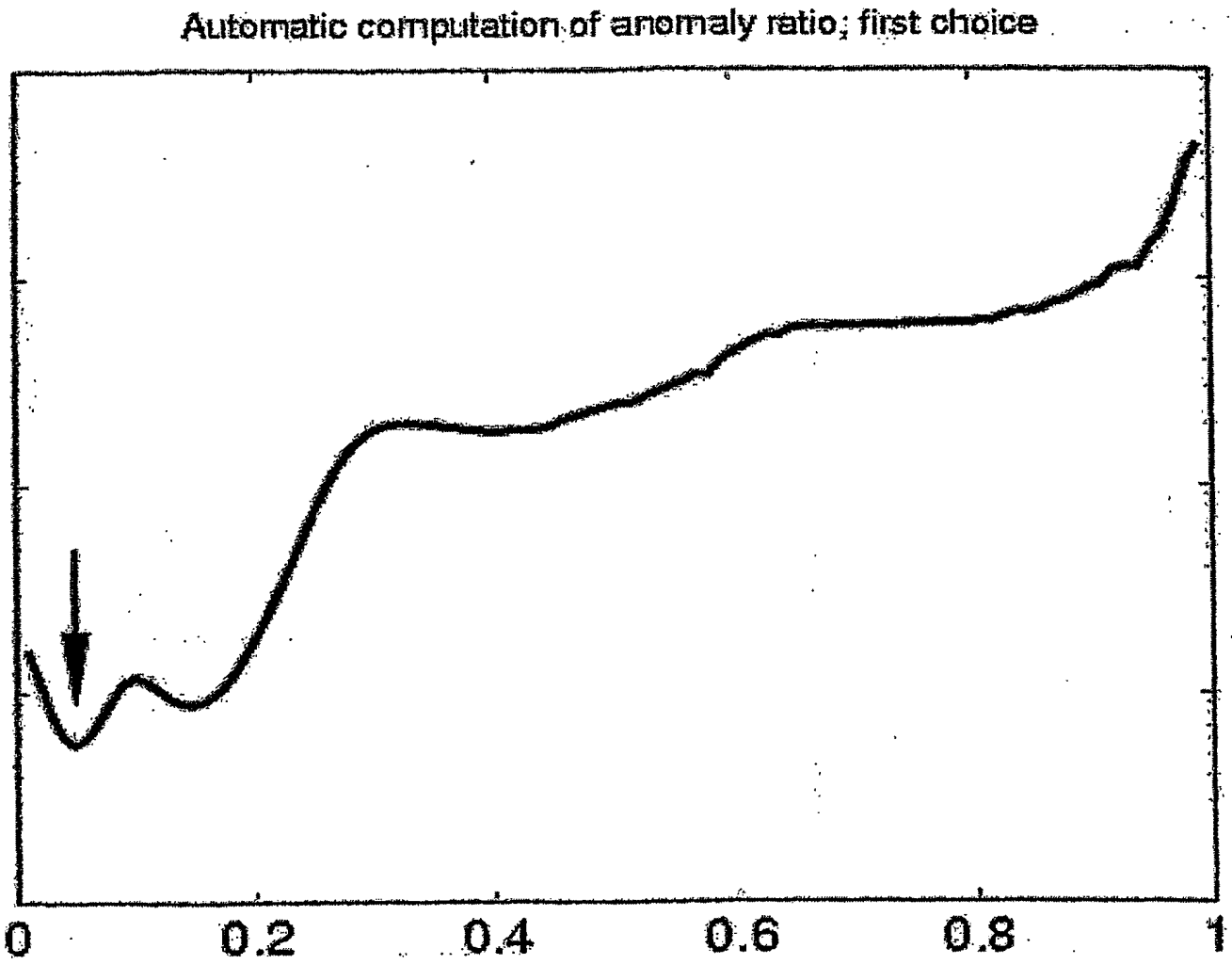

Automatic computation of anomaly ratio; first choice
0
0.2
0.4
0.6
0.8
1

FIG 6B

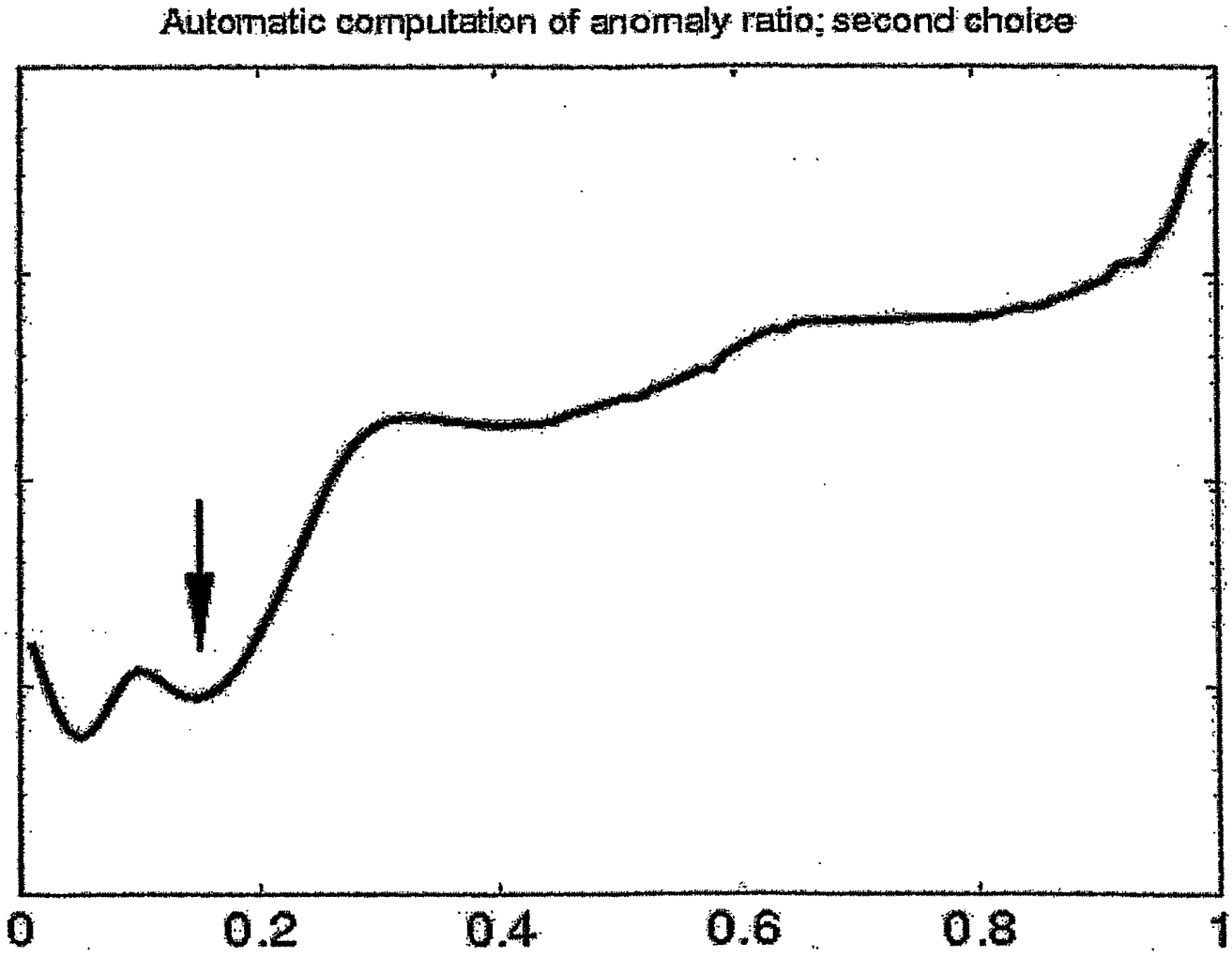

Automatic computation of anomaly ratio; second choice
0
0.2
0.4
0.6
0.8
1

FIG 6C

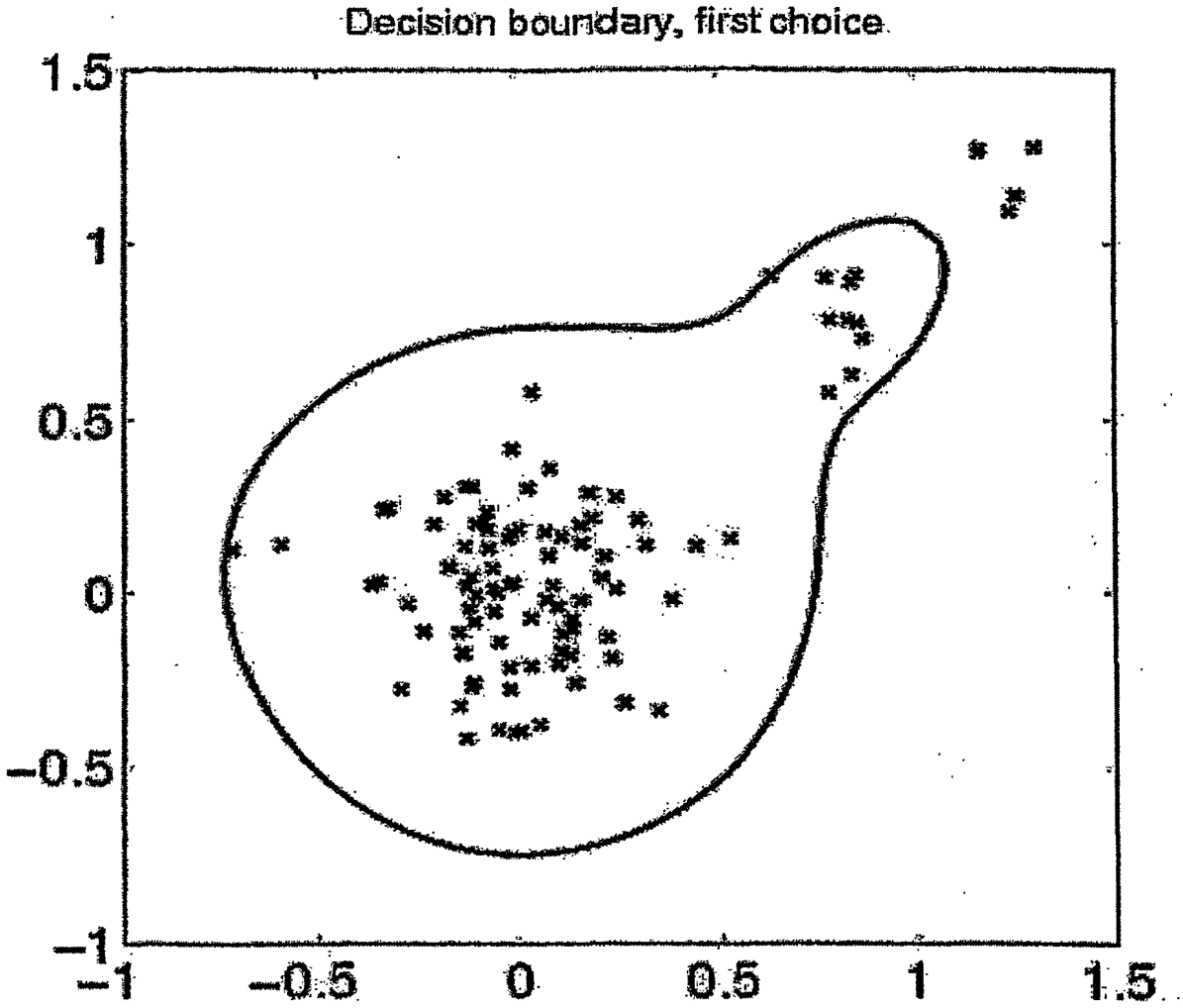


FIG 6D

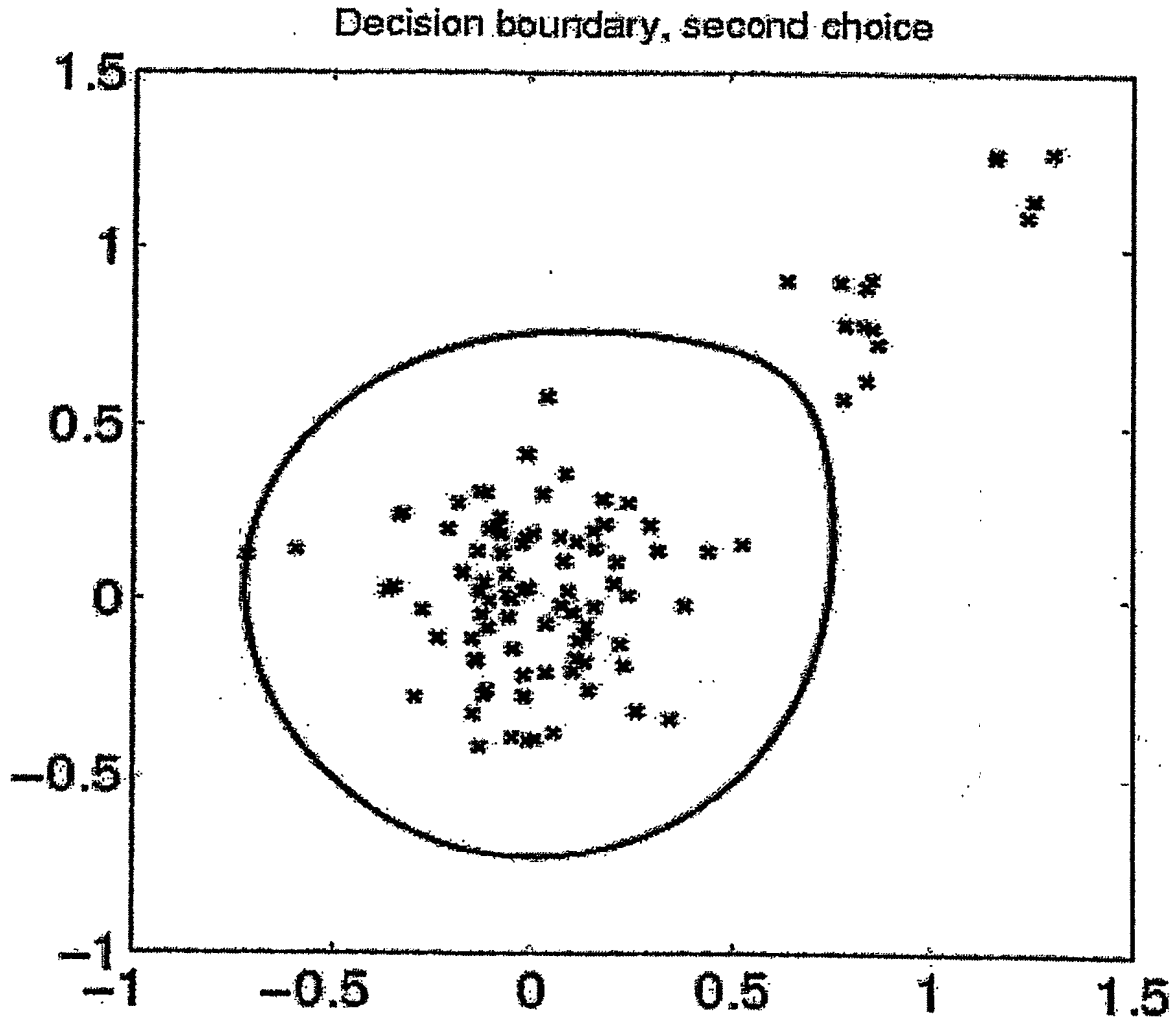


FIG. C2

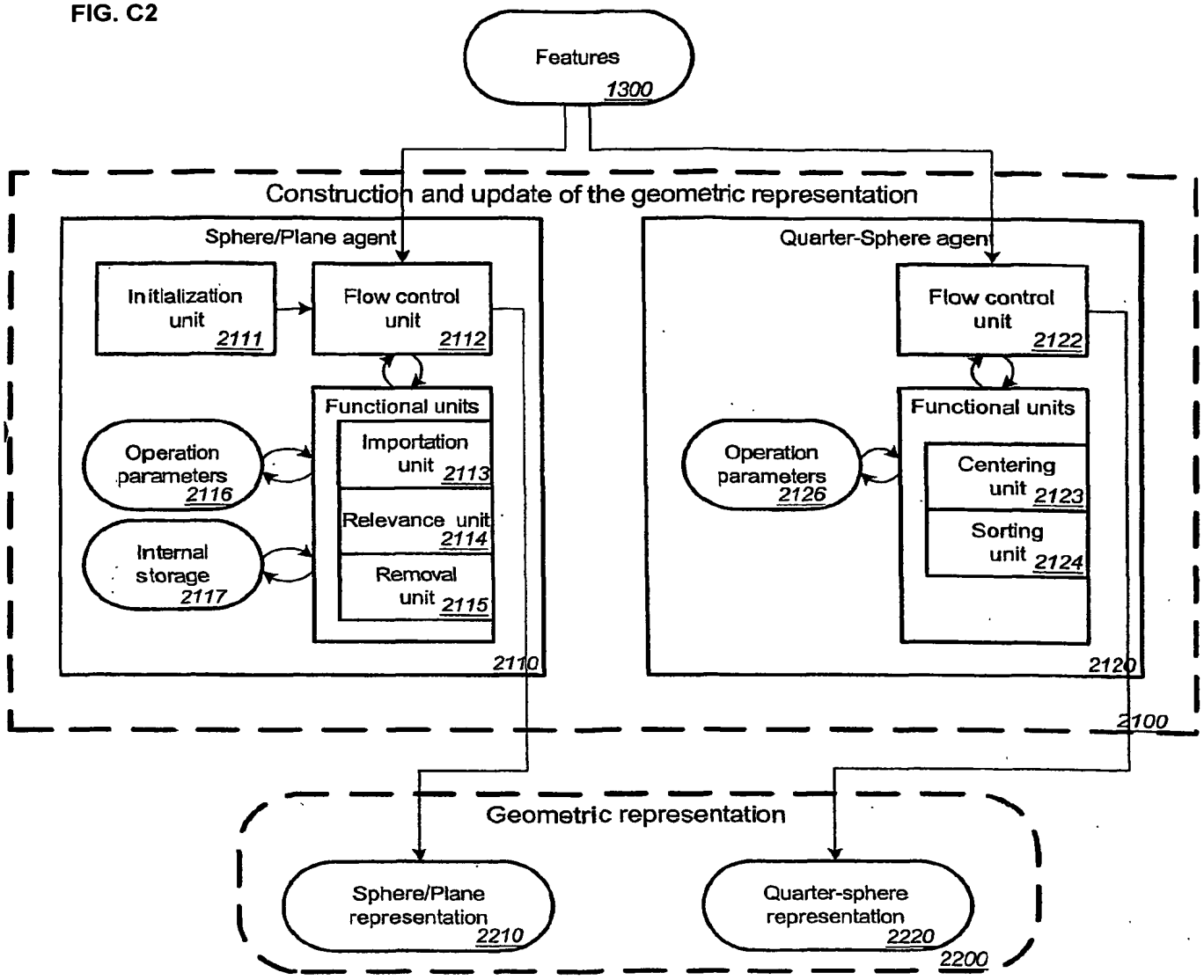

Features
1300
Construction and update of the geometric representation
Sphere/Plane agent
Initialization unit 2111
Flow control unit 2112
Functional units
Importation unit 2113
Relevance unit 2114
Removal unit 2115
Operation parameters 2116
Internal storage 2117
2110
Quarter-Sphere agent
Flow control unit 2122
Functional units
Centering unit 2123
Sorting unit 2124
Operation parameters 2126
2120
2100
Geometric representation
Sphere/Plane representation 2210
Quarter-sphere representation 2220
2200

FIG. C3

Flow Control Unit of the Plane/Sphere agent

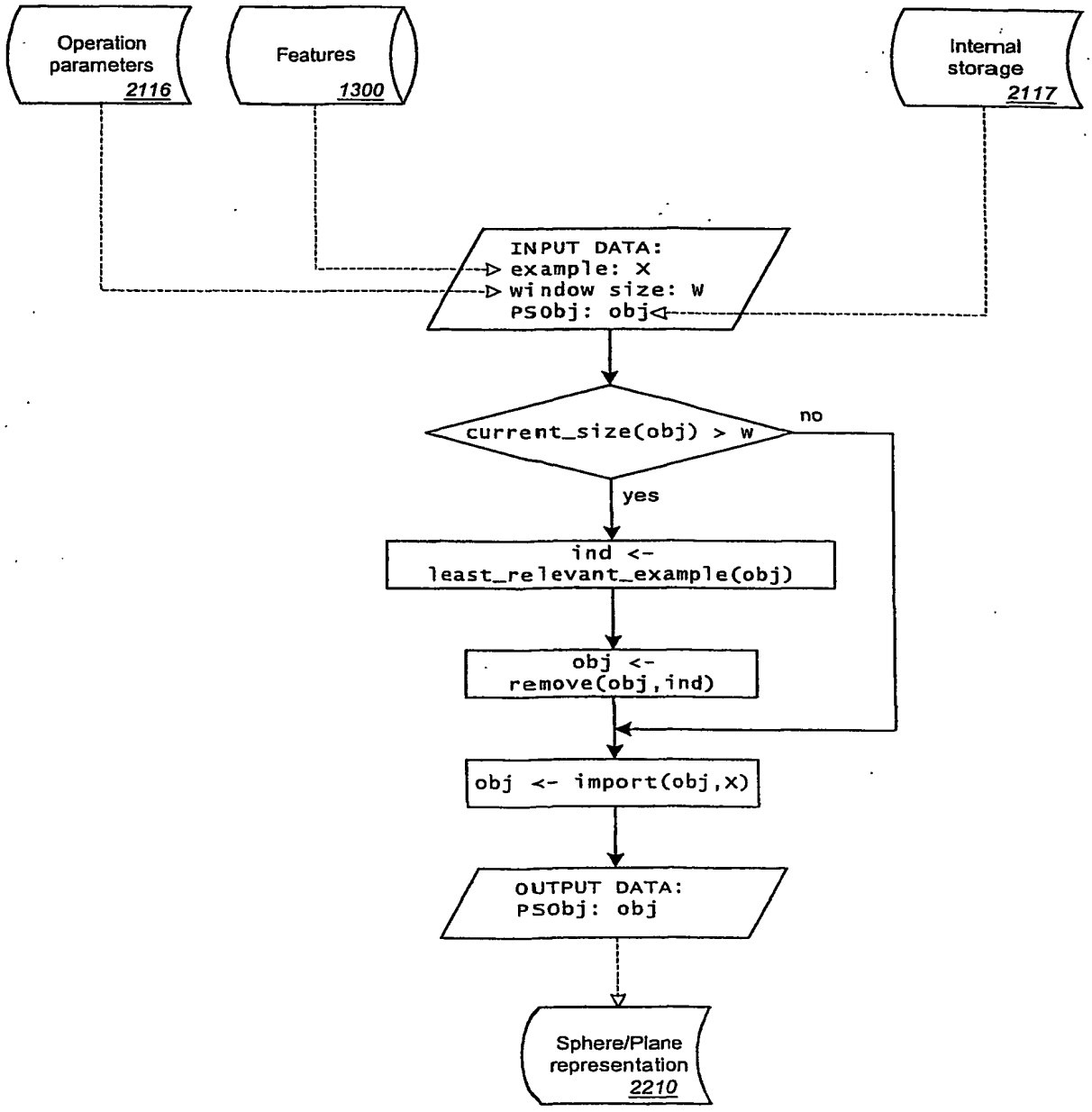


FIG. C5

Importation Unit of the Plane/Sphere agent

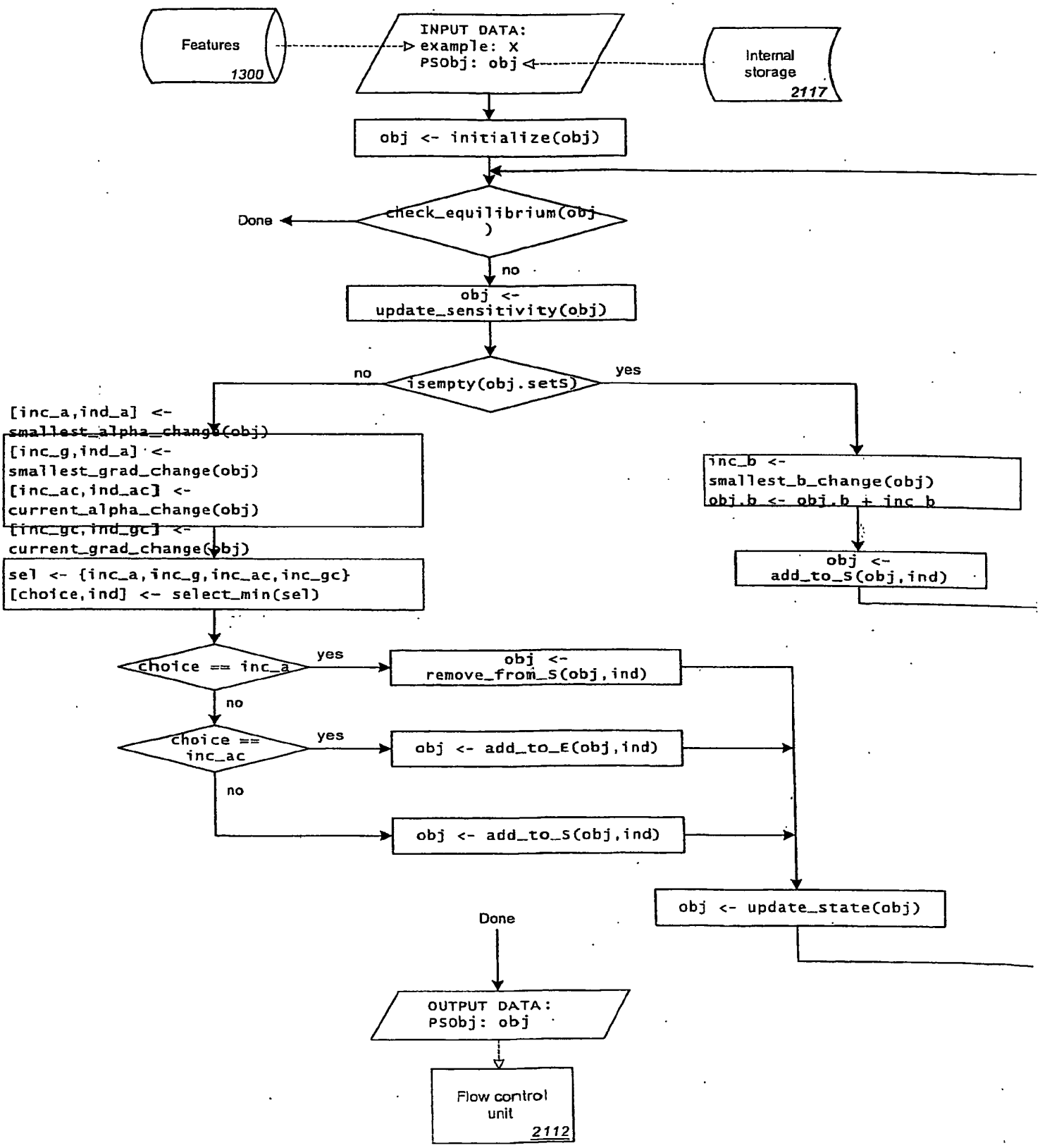


FIG. C6

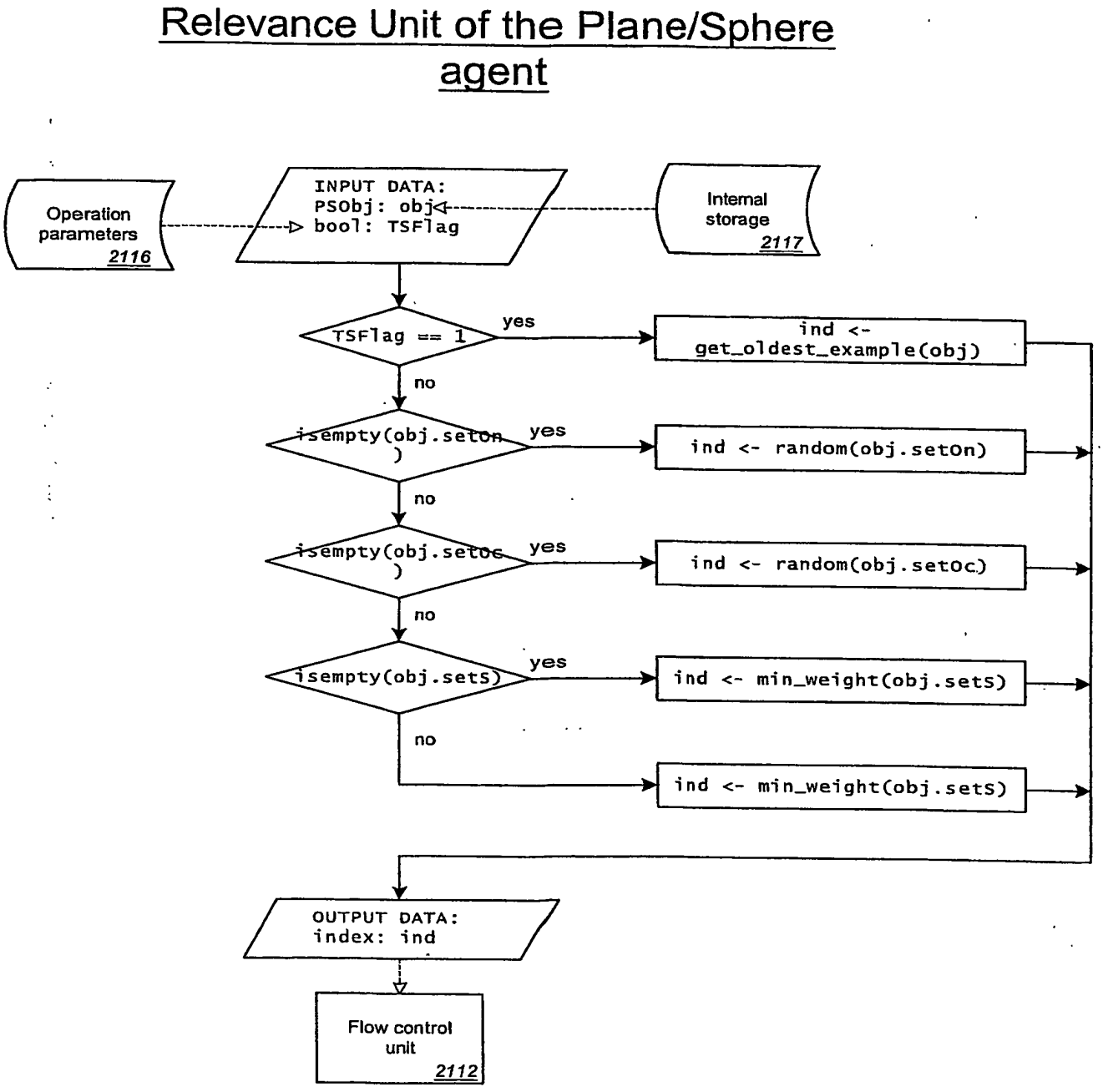

Relevance Unit of the Plane/Sphere agent
Operation parameters 2116
INPUT DATA:
PSObj: obj
bool: TSFlag
Internal storage 2117
TSFlag == 1
yes
ind <- get_oldest_example(obj)
no
isempty(obj.setOn)
yes
ind <- random(obj.setOn)
no
isempty(obj.setOc)
yes
ind <- random(obj.setOc)
no
isempty(obj.setS)
yes
ind <- min_weight(obj.setS)
no
ind <- min_weight(obj.setS)
OUTPUT DATA:
index: ind
Flow control unit 2112

FIG. C7

Removal Unit of the Plane/Sphere agent

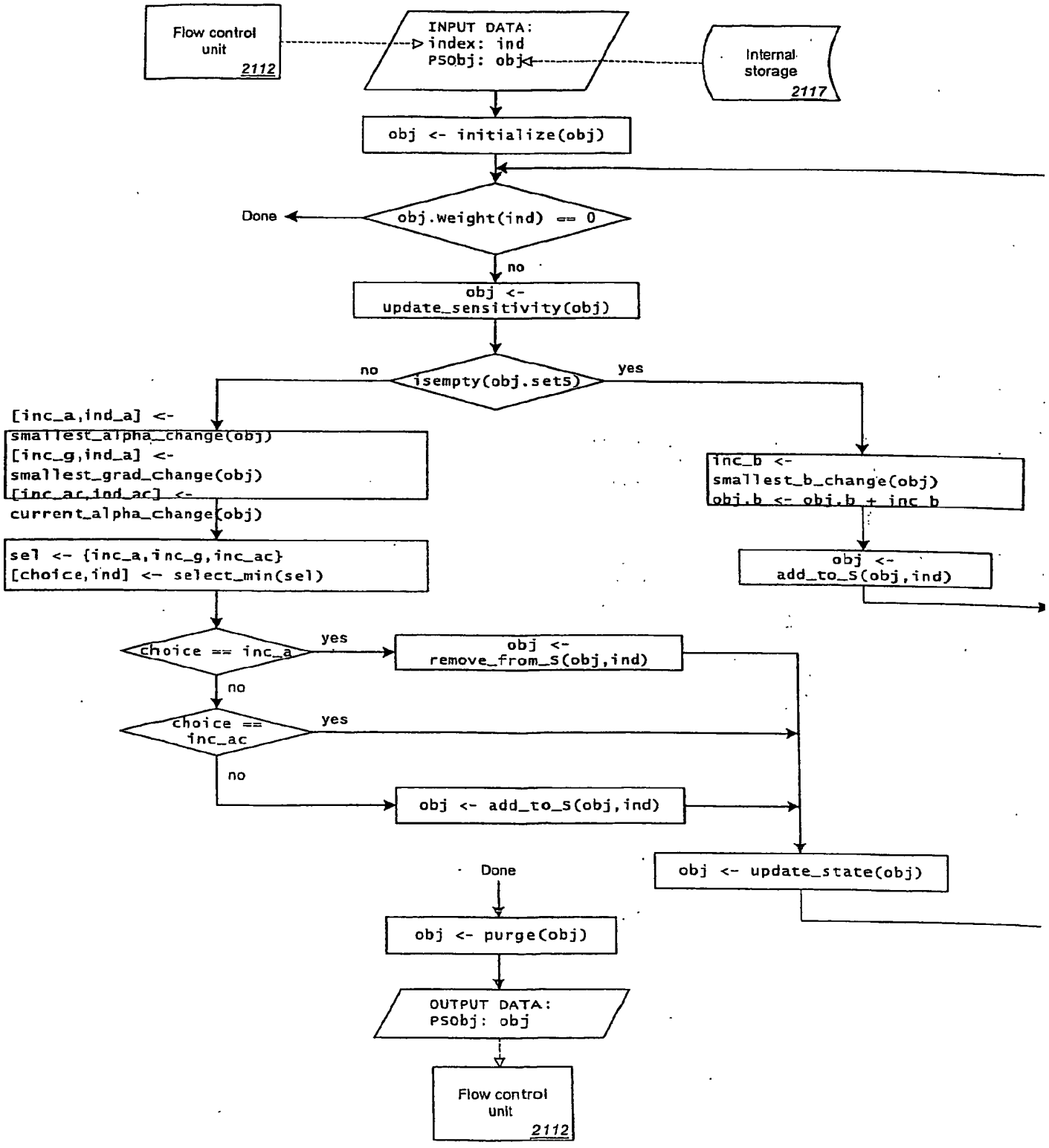


FIG. C10

Flow Control Unit of the Quarter-Sphere agent

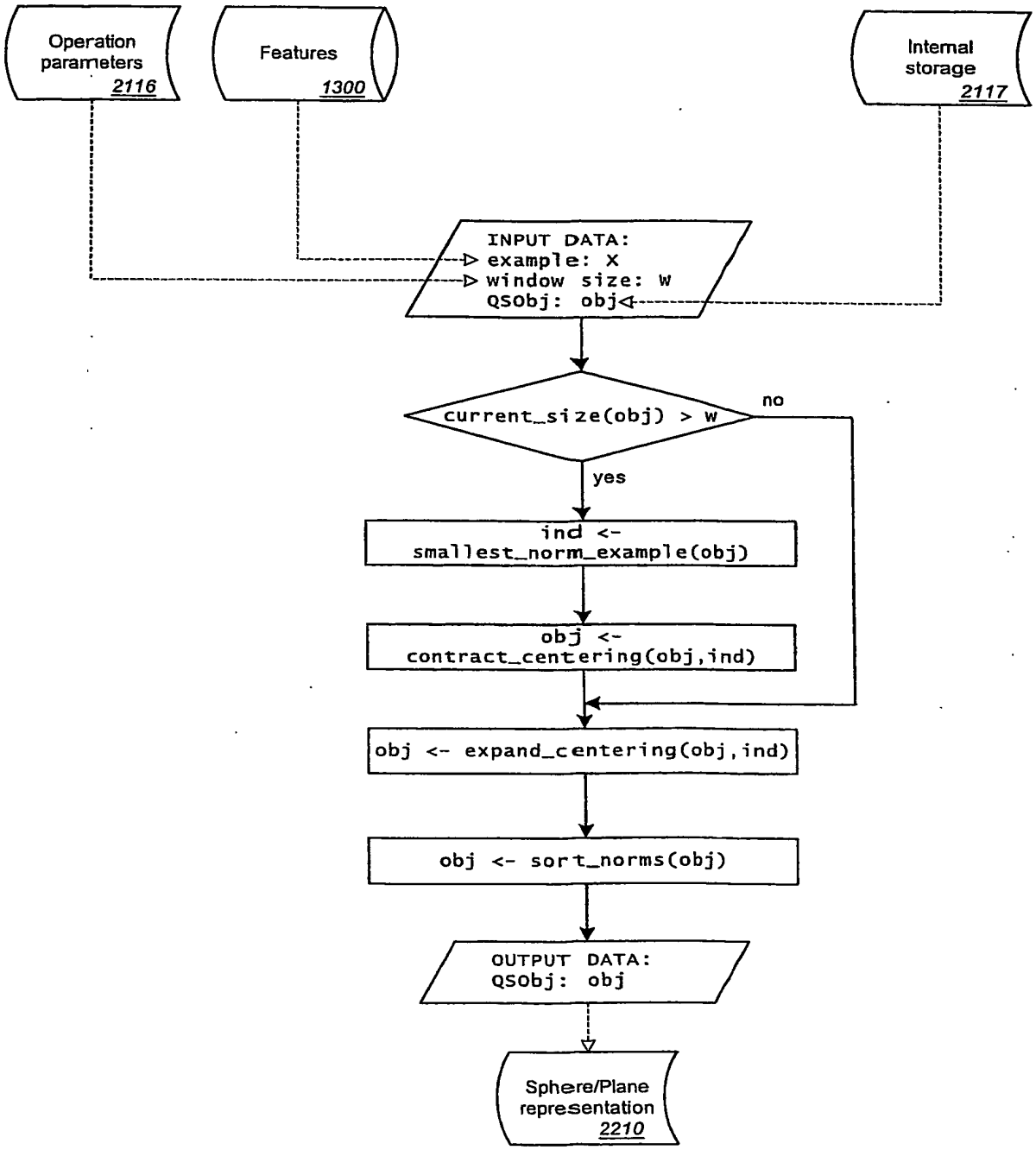


FIG. C11

Centering Unit of the Quarter-Sphere agent

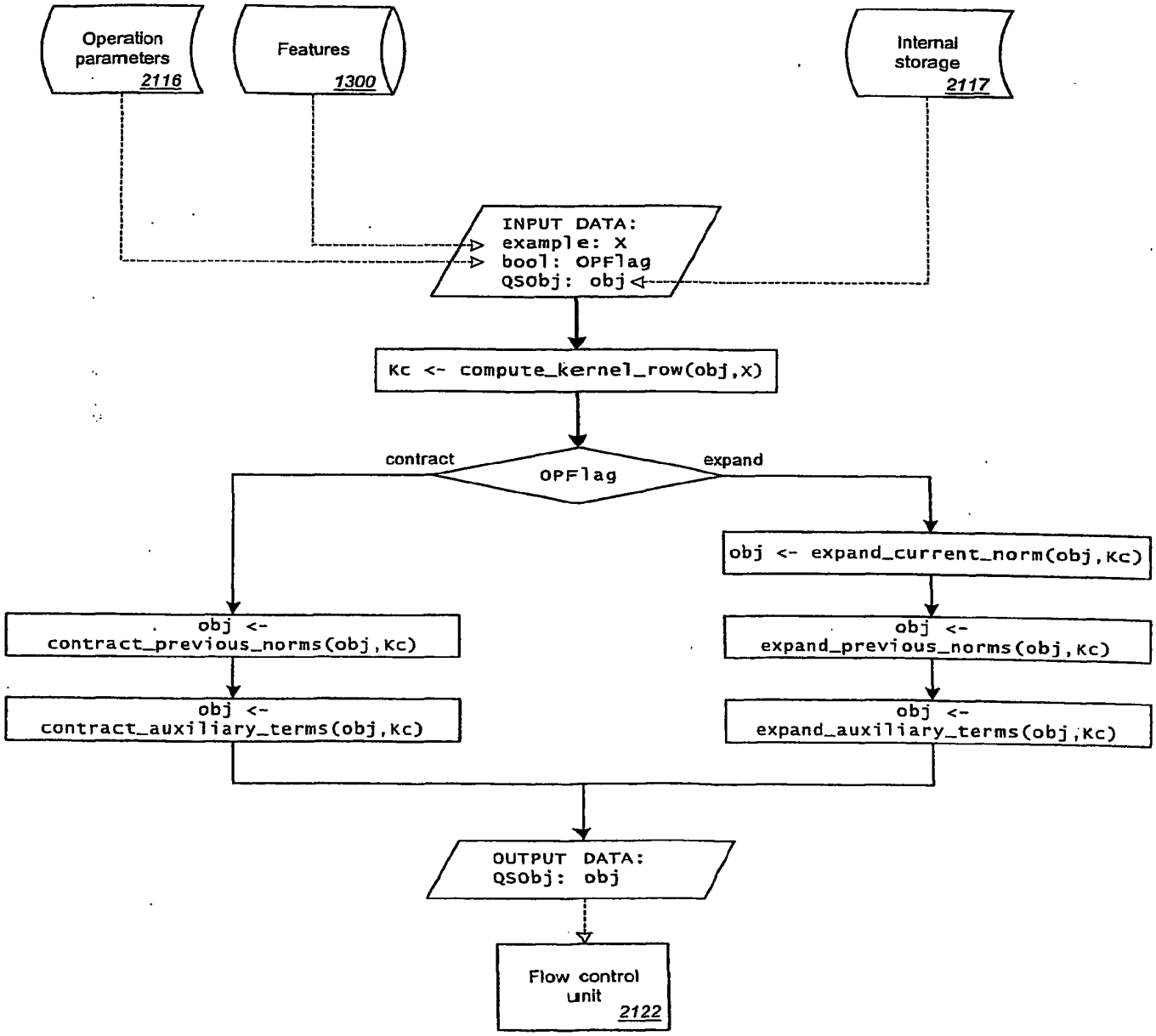
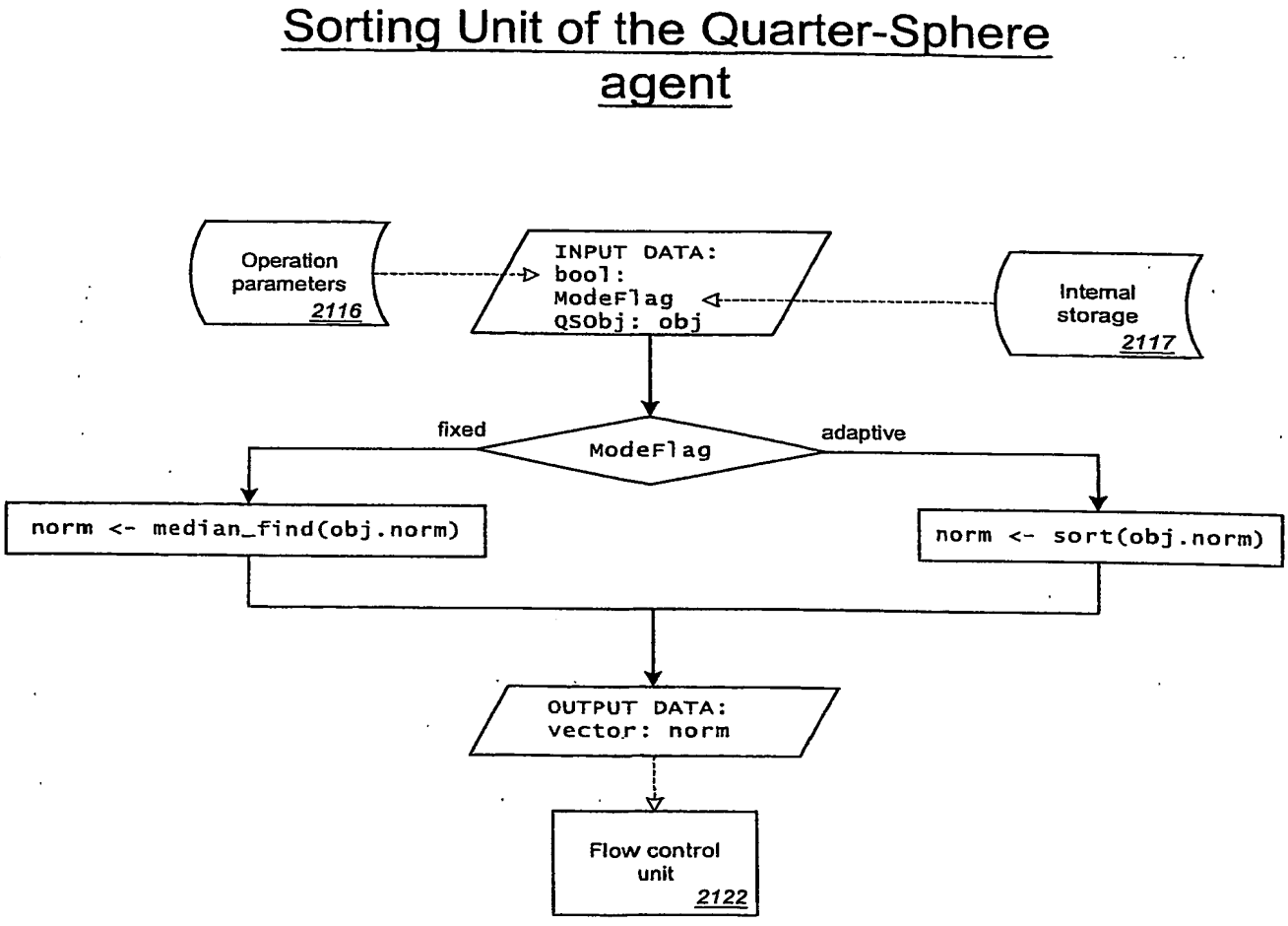


FIG. C12


Sorting Unit of the Quarter-Sphere agent
Operation parameters 2116
INPUT DATA:
bool:
ModeFlag
QSObj: obj
Internal storage 2117
fixed
ModeFlag
adaptive
norm <- median_find(obj.norm)
norm <- sort(obj.norm)
OUTPUT DATA:
vector: norm
Flow control unit 2122